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Mapping Learning in Higher Education: The Embedding Content Across Academic Programmes Toolkit

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Abstract

The growing diversification of teaching roles in higher education and the siloed nature of semesterised programmes can inhibit quality teaching and learning. This paper introduces the Embedding Content Across Academic Programmes Toolkit (ECAAPT), a practical model for mapping and tracking embedded content across modules, semesters, and years within higher education programmes that can ease the administrative burden of curricular mapping and change on academics teaching in the sector. Originally developed with a focus on tracking student academic literacies, this model has also been adapted and shown value in mapping and tracking other content, such as graduate attributes, feedback, assessment strategies, and learning outcomes (Bloom's taxonomy). Practical uses of ECAAPT are outlined, such as in the mapping required for programmatic review and in the constructive alignment of module content and/or programmes. Using a resource such as ECAAPT can aid in developing a more coherent structure in terms of planning and development of new modules and courses, tracking existing programme/module delivery over time, as well as allowing for greater ease of co-ordination of changes and development of courses and programmes under review. One key element of ECAAPT is that it includes guidelines for how to operationalise it for specific local requirements.

Keywords: Curricular mapping, graduate attributes, academic literacies, assessment, course design, change management

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Higher education aims to cultivate a sense of lifelong learning (Tormey et al., 2021) in students across inter-connected knowledge areas over their years of study, and beyond. One barrier to achieving this goal can be the disciplinary silos that exist within universities and other higher education institutions (Björklund et al., 2019; Freeman et al., 2020). Alongside these, the increasing diversification of teaching roles in higher education (Clarke et al., 2015), coupled with the need to respond to national and international societal and economic trends (Royal Irish Academy, 2021), underscore the need for continued support for academic staff. This paper introduces the Embedding Content Across Academic Programmes Toolkit (ECAAPT), a practical resource for mapping and tracking embedded content across modules and years within higher education programmes. ECAAPT can support a more cohesive and co-ordinated approach to teaching and learning within and across degree programmes. By cooperatively engaging with ECAAPT at a department, programme, or stage/year level, instructional decisions can be justified more clearly and intentionally (Amundsen et al., 2008).

The idea to create ECAAPT originated from the desire of the authors to develop a means by which to map, track, and embed necessary foundational academic literacy skills within a specific stage of a higher education programme. Further detail on the funding and development of this project is included later in the paper (*Toolkit Development* section). Wise (2009), talking about secondary level education, called literacy "the cornerstone of student achievement" (p. 373) and that these skills are foundational to any further academic success. To succeed in higher education, and, as Faulkner (2012) points out, in "the wider community" (p. 9) beyond academia, students' literacy skills – reading, writing, and speaking – need to be sufficiently developed to enable them to engage in learning at the required level.

ECAAPT provides a simple means by which to track content, embedded or to be embedded, in and across academic modules and programmes, such as academic literacies, graduate attributes, assessments, and learning in general. This tracking and mapping can contribute to a more coordinated and cohesive approach to teaching

and learning across programmes, departments, and faculties. In addition, ECAAPT has the potential to be used as part of a structure for building and developing new programmes in a coherent and logical manner to show where the content necessary to develop the desired graduate attributes is embedded across all years of a programme. This could also make programmatic review, and in particular the external review process related to same, easier to manage.

This paper begins with an exploration of curricular and assessment mapping, both of which ECAAPT was designed to support, before describing the processes involved in developing the toolkit. Following this is a section detailing how to use ECAAPT and where to source it from.

Curriculum Mapping & Assessment

A curriculum is a collection of all of the "learning outcomes, courses, course materials, and assessments" (Joyner, 2016, p. 83) involved in a particular learning experience, or degree in terms of higher education programmes. Curriculum mapping is a means of understanding how effectively the day-to-day work of teaching aligns with the overall goals, or graduate attributes, of a programme (Buchanan et al., 2015). Curricular or course maps can be used for refining content, identifying gaps and repetition, or for accreditation purposes (Ried, 2011; Weston et al., 2020).

In her critique of curriculum mapping models, O'Neill (2010) found a number of key differences across models in terms of timing, simplicity, and information gathered. The simpler models she reviewed, such as Diamond's (1998), provided an overview of some approaches for planning or reviewing curricula, including a checklist to ensure that course goals are clearly defined in the curriculum design process. Others, like Sumsion and Goodfellow's (2004), described more detailed approaches, focused on the relevance of the graduate attributes, and the extent to which they are taught/covered in specific modules. See Table 1, below, for a comparison of the two models. O'Neill critiqued a third model (Knight, 2000), which is not included here as it has, as O'Neill also notes, a different approach to curricular mapping, which is not as applicable to ECAAPT.

Regardless of the model being used, the level of faculty engagement in any mapping process is central to its success. Any such mapping exercise can be useful in evaluation for change or improvement. Reform measures stemming from any evaluation of a curriculum can be dependent on incorporating the beliefs and values of the faculty (Rahimi et al., 2010). For a mapping process to have value in higher education, it may need to involve developing "a means of curriculum renewal which causes teachers and learners to think about learning and teaching" (Little & McMillan, 2014, p. 12). Once thought through, teaching and learning practices can be adjusted to align with the current and future needs of graduates. Indeed, mapping and coordination at this

level could increase the likelihood of deep learning for students (Winje & Løndal, 2020). Whilst there is an amount of literature available on both graduate attributes and curricular mapping, our searches found little practical guidance for how to operationalise the models recommended. Indeed, we would argue that Clanchy and Ballard's (1995) position that much of the literature is beset "by a pervasive vagueness and inconsistency" (p. 155) at an operational level is still applicable 30 years later.

TABLE 1

A Comparison of Existing Mapping Tool Elements

Model and Elements		***Explanation***
Diamond (1998)		*Students:*
	Introduced	experience this for the first time.
	Used	use this skill during the module learning.
	Further Developed	apply this skill in a more complex manner.
	Comprehensively Assessed	have to demonstrate this skill as a part of the module/ programme assessment.
Sumsion and Goodfellow (2004)		*Students:*
	Assumed	are assumed to have acquired this skill prior to this module.
	Encouraged	are encouraged to gain/practice/refine this skill in this module.
	Modelled	experience this skill modelled by teaching staff and other students.
	Explicitly Taught	are explicitly taught this skill.
	Required	are required to demonstrate this skill.
	Evaluated	are evaluated on this skill.
	Additional Comments	

We contend that some of the issues with curricular mapping models have nothing to do with the concept(s), but more with the lack of a detailed process for how to gather and refine the local data required to develop such a map. For example, Kelley et al. (2008) put forward a 5-step process for curricular mapping, namely, planning, creating a code, faculty input and data gathering, analysis of map, and implementation of changes. We would argue that the implementation of change is the main reason for curricular mapping, more so than to "satisfy accountability requirements" (Kelley et al., 2008, p. 2). Being able to map curricula in a systematic fashion enables faculties to keep up with the "ongoing assessment, evaluation, innovation, and adaptation" (Ried, 2011, p. 1) of contemporary higher education practice.

ECAAPT is a simple and adaptable toolkit that can assist users in gathering the

information in Kelley et al.'s (2008) step 3, faculty input and data gathering, or any other model faculty may favour (e.g., Ried, 2011, systematic assessment model). Once a plan has been developed and the focus of the mapping established – design, delivery, or assessment (Kelley et al., 2008) – ECAAPT allows for a ready-made structure with which to gather relevant data. Any such mapping process can allow for a more comprehensive awareness among faculty of teaching and assessment methodologies, facilitating constructive alignment with student learning (Gillett & Hammond, 2009).

The ability of faculty to identify and develop specific knowledge and skills can have significant benefits for students when it comes to assessments and working after completing their degree programme (Weston et al., 2020). One important example here, academic writing, is seen as a fundamental aspect of learning in higher education (Aitchison & Lee, 2006). How academic writing is assessed can be a substantial inhibitor or promotor of learning. Zhou et al. (2020) suggest that the types of feedback and assessment, specifically for first-year students' developing academic literacies, can reshape "students' beliefs about the nature of knowledge and their related learning" (p. 267). Boud and Falchikov (2006), as well as Saltmarsh and Saltmarsh (2008), considered the role of assessment in student learning and argued that assessment should not only address the specific aspect of a module or programme, but also add a link to the overall learning beyond the specific module or learning outcome in question. This emphasises a process focus over a product focus (Gillett & Hammond, 2009). Assessment mapping, similar to curricular or course mapping, all of which ECAAPT can be used for, can allow such an aim to come closer to realisation.

Methodology

This section provides an overview of the chosen methodology and ethical considerations for this project.

Philosophical paradigm and research design

ECAAPT was developed within a social constructivist paradigm. Action research was deemed a useful approach within this paradigm as it aims to "change people's *practices* and the *situations* in which people practise" (Kemmis, 2010, p. 421, emphasis in original), as well as to assist in developing a deeper understanding of practice. Action research also includes a critical reflective element (Cohen et al., 2011; Henthorn et al., 2024), which can have a positive influence on teaching practice(s). The key objective, within the data generation phase, was to develop a working curricular mapping toolkit in collaboration with higher education colleagues.

In total, seven lecturers, across three departments (broadly health-, sport-, and biology-focused) in two faculties (social sciences and science, technology, engineering, and

mathematics [STEM]) assisted the authors in developing ECAAPT. This assistance was mostly in the form of testing out various iterations of the toolkit and providing critical feedback using the Delphi method (Fletcher & Marchildon, 2014). The Delphi method involves sharing multiple versions of the project, in this case the toolkit, with the expert panel for critical review and feedback. This feedback is then taken into account and a revised draft developed, before it is shared with the expert panel again for further review and critique.

There were three phases involved in the toolkit development over the space of two semesters. Initially, the authors experimented with early versions and once they had developed a working draft, five collaborators from two departments engaged in a Delphi method for three iterations to further refine the toolkit. Finally, two colleagues from a third department engaged in reviewing two iterations of a revised toolkit. One of the key advantages of the Delphi method is the flexibility it offers in engaging the expert panel. There was no requirement for all panel members to meet up and share collectively (Cohen et al., 2011). Panel members could review and feedback when they had time in their schedules.

All participants in this project, having a clear understanding of ethics themselves, gave full informed consent to be involved. The five panel members on phase two were a purposive sample to gain a broad base of expertise across faculties. Some of the participants were known to the authors, and they were approached initially through either email or phone calls. Those that were not known were requested to take part by their department colleagues who had already agreed to participate. All invited participants agreed to take part. The two panel members in phase three were recruited from a third department, through an open call to anyone interested in participation.

Finally, a pilot study was deemed unnecessary for this project. The content of the toolkit was refined to a usable stage in phase one by the authors, in essentially the same process as a pilot would have. Then, once the toolkit was at a working draft stage, the Delphi method began.

Ethics

All panel members were verbally briefed initially on the project and the role they were being asked to take on, prior to written materials being sent to them via email. Timeframes for feedback on the toolkit's performance were agreed, and all participants were aware that they could withdraw their consent to take part at any time. As no personal data were being recorded, and all participants were experienced university lecturers, this project was deemed minimal risk for all involved.

The Embedding Content Across Academic Programmes Toolkit (ECAAPT)

The following description clarifies both the development and recommended use of ECAAPT, outlining how the toolkit was developed and how it may be applied.

Toolkit Development

The initial idea for developing ECAAPT arose from the involvement of authors one and two of this paper in the delivery of an academic support module to first-year students in a higher education institution in Ireland. Within that module, students were engaging in weekly tasks to develop their academic literacy skills that would be highly relevant and transferable to other modules they were studying at the time as well as future modules. It became apparent that mapping the interactions students had with these skills in other modules (such as explanation, modelling, and assessment) could reinforce their transferability across the programme, and that even more opportunities to practise and develop the skills could be embedded into module delivery. The overall goal was to ensure a more consistent approach to developing and retaining these fundamental skills and, as a result, provide an opportunity to deepen student understanding and contextualisation of the application of these skills.

Around the same time as we were discussing this idea, a funding opportunity arose through the Strategic Alignment of Teaching and Learning Enhancement (SATLE) 2020 funding programme. The SATLE 2020 funding programme was an initiative of the National Forum for the Enhancement of Teaching and Learning in Higher Education (2020) in Ireland. While completing the funding application, authors one and two identified project partners in other departments within their higher education institution, who would act as an expert sounding board for ideas and be invited to test the various iterations of the toolkit using a Delphi method, described further earlier in this paper (see also Cushing et al., 2019; Hasson et al., 2000). Experts from three departments agreed to take part. Following a successful funding application, the iterative Delphi process began. Phase one involved the authors developing a prototype version, before the iterative process of phase two began between the expert panel and the authors (project leads). Feedback from the experts informed the development of ECAAPT and, once it was at a functional stage, it was tested further in phase three across a suite of first-year modules. This prompted further refinement of the toolkit, as well as the development of guidance notes and videos to support its application.

Following further testing and modifications, the toolkit was made available at the university level via a webpage on the Munster Technological University's website. This allowed all faculties and departments to access the toolkit. The promotion of ECAAPT

culminated in the delivery of an information seminar as part of the institution's Conversations on Teaching and Learning Seminar Series (CoTAL) in May 2023. Staff attending this seminar were introduced to the toolkit and were provided with an opportunity to practically engage with it.

Using ECAAPT

ECAAPT can be used as a one-off, standalone mapping project, though may be most useful as part of the data compilation and analysis stage in a curricular mapping process, once adequate planning has been conducted and metrics agreed (see Kelley et al., 2008). This section provides a brief overview of how to use ECAAPT.

Two versions of ECAAPT are detailed below. The first is a manual version that is freely available to the public to download and use. In the public version, users have to input all data for each module themselves. Detailed guidance can be found in the guidance notes available here. The second version has been automated and linked to the programme and module information specific to the authors' university so that a lot of the information needed can be entered automatically. Within this automated version, ECAAPT automatically gathers key details (e.g., assessment types and weightings) from the relevant university programme and module documents. This means the data are not only accurate but also always up to date as the current working documents from the university are used. This version also automatically produces basic charts and tables of the inputted content. The development of this integrated and automated version was made possible through a subsequent round of SATLE Reusable Learning Resource funding in 2023, again through the National Forum for the Enhancement of Teaching and Learning in Higher Education.

ECAAPT – Public Version

Three distinct options within the toolkit have been developed, focused on skills and attributes, assessments, and Bloom's taxonomy, respectively (see Figures 1-3). Using an Excel interface, each option follows a similar model. In all options, the modules are inputted horizontally, and it is possible to specify the delivery mode(s) within modules (lectures, tutorials, or seminars, for example), if needed. The particular focus of each option (skills and attributes, assessments, or Bloom's taxonomy) is added vertically on the left. Once the specific page has been chosen and the module names added, the main part of the page can be filled in by the lecturing team. Guidance notes for the public version were developed to further avoid some of the perceived operational vagueness and inconsistency in the guidance for mapping models noted by Clanchy and Ballard (1995) earlier in this paper.

FIGURE 1

The ECAAPT Skills and Attributes Template

Skills & Attributes Template		Academic year:		Semester:	
© 2024. This work is openly licensed via CC BY 4.0.		Insert Module/Stage/Programme in next row			
		Module Name			
		Delivery Mode (lecture, tutorial, etc.)	When (week in semester)	Delivery Mode (lecture, tutorial, etc.)	When (week in semester)
	Competency/Attributes				
Assumed	Insert chosen topic, e.g. critical thinking, referencing				
Evaluated/Assessed					
Modelled					
Required					
Explained					
Practiced					

The skills and attributes template has a refined list of elements (see Table 2). Along with noting whether the skill or attribute in question is assumed, evaluated/assessed, modelled, required, explained, and/or practised, other information includes when this occurs within the semester, programme, and/or academic year.

TABLE 2

Elements of the ECAAPT Skills and Attributes Template

Key Options	Definition
Assumed	Students already have a working knowledge of this skill.
Evaluated/Assessed	This is part of a rubric used in grading on the module.
Modelled	Lecturers demonstrate best practice in relation to this skill during the module.
Required	Students need to know this to meet the learning outcomes of the module.
Explained	This is explained within the context of the module.
Practised	Students apply this as part of the module.

The assessment template (Figure 2) requires three pieces of information; namely, which assessments occur in each module, when they occur, and the weighting of each assessment. The Bloom's taxonomy template (Figure 3) calls for the order of skills to be noted (i.e., higher-order or lower-order skills), as well as when this occurs in the academic year (this could be focused on learning outcomes, or assignments, for example). More detailed instructions can be found here.

FIGURE 2

The ECAAPT Assessment Strategies Template

Assessment Template	Academic year:		
	Insert Module/Stage/Programme in next row		
	Module Name		
	Assessment Strategy (Yes/no)	When (in semester)	Weighting (%)
Academic Essay			
Annotated Bibliography			
Article			
Case Study			
FEO (Final Exam Other)			
FES (Final Exam Scheduled)			
In-Class Exam			

FIGURE 3

The ECAAPT Bloom's Taxonomy Template

Bloom's Taxonomy Template			Academic year:		Semester:	
			Insert Module/Stage/Programme in next row			
			Module Name			
			Delivery Mode	When	Delivery Mode	When
	Competency/Attributes					
Create	Design, construct, plan, produce, invent, devise, make.	Higher order skills				
Evaluate	Check, hypothesise, critique, experiment, judge, test, detect, monitor.					
Analyse	Compare, organise, deconstruct, attribute, outline, find, structure, integrate.					
Apply	Implement, carry out, use, execute.	Lower order skills				
Understand	Interpret, summarise, infer, paraphrase, classify, compare, explain, exemplify.					
Remember	Recognise, list, describe, identify, retrieve, name, locate, find.					

In its publicly available version, analysis of the data generated within ECAAPT must be conducted manually. Once all the relevant information has been inputted, a scan of the data may prove sufficient for the required analysis. If not, the analysis functions

in Excel (or another programme) can be utilised to suit the focus of the planning/development in question. This is especially useful if the findings from ECAAPT are to be shared with a programme or departmental team. Indeed, for the process to be as successful as possible, the generated files (i.e., completed templates) may need to be shared with relevant departmental staff to complete all sections *before* it can be analysed and shared as a completed document.

ECAAPT – University-Specific Version

A more automated version of ECAAPT, which is only available within the Munster Technological University, has been developed to work directly with the Approved Course Schedule (ACS). The ACS is a combination of all the module descriptors and programme information for the whole university in one or two files – it contains details about current programmes and module information, such as credits, learning outcomes, indicative content, assessment types and weightings, as well as the order of modules in each specific year of a programme. Essentially, the ACS is the university's specific database that includes all the relevant content and data for the operation of all academic programmes.

Compared to the public version, this university-specific version is more user-friendly because most of the data are automatically pulled from the programme documents, rather than requiring users to input everything manually making the whole process faster and reducing the workload, while also minimising errors that can happen with manual data entry. Specifically, the generation of graphs to present a basic analysis of the data in the completed skills and attributes template has been automated. Also, the assessment template has been more fully automated, so ECAAPT can "talk" to the relevant files and draw down the assessment data from chosen modules and programmes. The time the assessment(s) occur must still be entered manually. The Bloom's Taxonomy template currently requires manual entry (at the time of writing).

Other interested institutions may be able to develop a similarly automated version specific to their administrative systems. In our case, we needed to gain access to the up-to-date ACS, as well as gain permission to access the updated version of the ACS each year (as programmes are added, change, or develop). The description below of how this automated version was developed took place over two semesters and included several prototype versions. Unlike the public version, the university-specific version has been going through ongoing troubleshooting to refine both its appearance and operation. That said, the public version could be considered defunct; however, it remains important as anyone interested can trial using ECAAPT before committing to the larger task of funding and developing an automated version. Also, for new programme development tasks, the public version may be more efficient as the automated version only works for pre-existing course information.

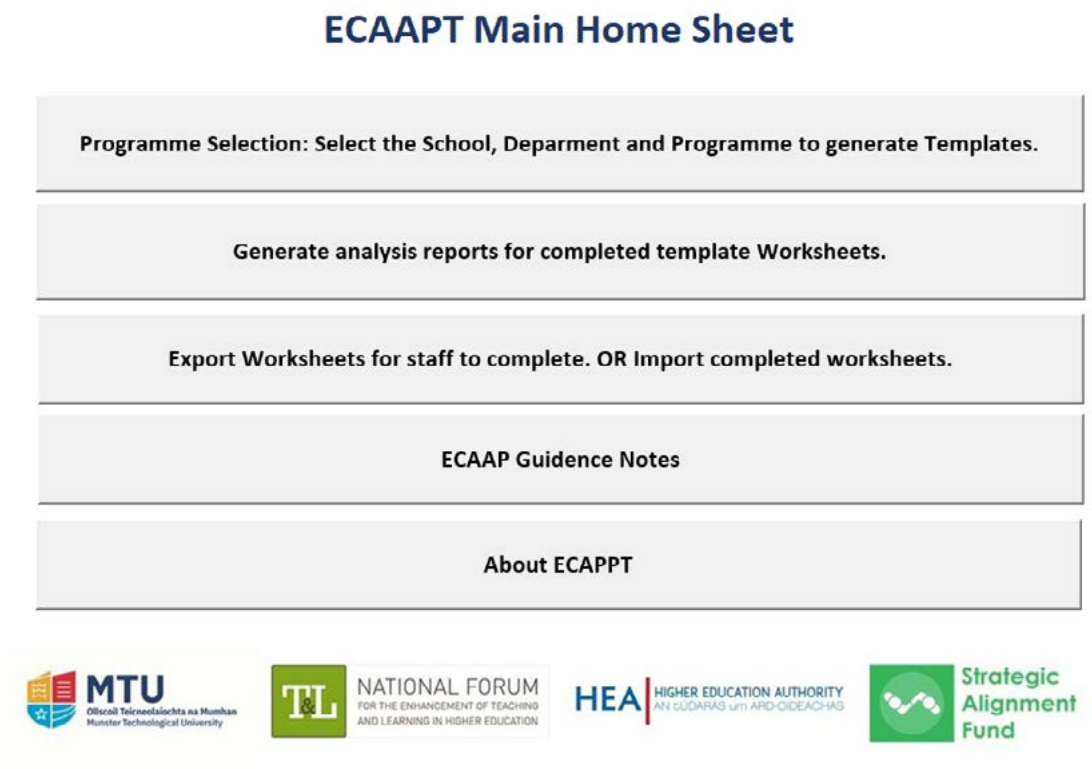
To make the integration (automation) work, a database script is first used to extract specific programme and module information from the university's central database, which includes details such as module codes, titles, delivery modes, and assessment types. This script creates several structured files, known as ACS files. ECAAPT can connect to these files using VBA (Visual Basic for Applications), a built-in macro programming language in Excel. Once connected, pre-programmed macros in ECAAPT automatically read the ACS data and populate relevant fields, such as delivery methods, assessment timings, and weightings, without the user needing to enter them manually.

For example, a script can be set to extract all assessment information for a selected programme, such as B.Sc. Computing. When ECAAPT opens the ACS file, it automatically pulls in the assessment types and schedules for all modules within that programme. This allows the user to focus on reviewing the data, rather than compiling them.

The university-specific toolkit is designed to be easier to use than the public version. There is a selection interface where users can choose the modules or programmes they want to analyse (see Figure 4). This is done through VBA forms that use drop-down menus populated automatically from the ACS data. This allows staff to select relevant modules without needing to work directly with the raw data. For the assessment template, ECAAPT then automatically generates summary reports and charts showing how assessments are distributed across modules, the types of assessments used, and when these assessments occur across the academic year. In the case of the skills and attributes template, the toolkit uses a similar interface to allow users to select modules and map each one against a predefined list of transferable academic skills. Users can indicate whether each skill is assumed, explained, modelled, practised, required, or assessed (see Table 2 for a breakdown of the working definitions of these terms) within a given module and delivery mode (e.g., lecture or tutorial). While this version does not yet include automated charting, the structured output makes it easier to identify patterns of skill development and to support discussions about scaffolding and consistency across programmes.

FIGURE 4

Homepage of the Automated (University-Specific) ECAAPT Version



One of the strengths of the university-specific version is that it is built to be modular and easy to update. The VBA code is structured in a way that separates different tasks, like data extraction, user input handling, and report generation into their own dedicated subroutines or functions. This makes it easier to maintain and update ECAAPT in the future as each part of the code can be revised independently without affecting the rest of the system. For example, if the format of the ACS data changes, only the relevant data extraction module needs to be updated. We have also incorporated an error handling process to catch and manage problems such as missing or incomplete data, so the toolkit continues running smoothly without crashing.

To address potential interest from readers outside our institution, it is worth clarifying that the university-specific version of ECAAPT is not currently publicly available, as it was developed in-house using internal systems and data structures. However, the approach and structure of the tool, particularly its use of modular VBA, form-based selection, and automated report generation, could be adapted for use in other institutions. While the scripts used to extract data from our university's database are not publicly available due to system-specific dependencies, the logic behind them could be replicated by IT or academic development teams with access to similar course management data. Currently, there is no formal licensing framework in place

for the more automated version, however, we are open to discussing collaboration or adaptation with interested higher education institutions. The freely available, creative commons licenced, public version offers a useful starting point for mapping projects, especially for institutions lacking automated data integration infrastructure.

In short, this internal version of ECAAPT represents an advancement in the process of mapping out curriculum and assessments within the university. By extracting data directly from the ACS using scripts, a significant portion of the analysis is automated through macros. Thus, the toolkit enables departments to conduct their analyses as part of a larger planning or development process more efficiently and consistently, thereby enhancing decision-making in programme planning and assessments.

Summary

ECAAPT is a flexible resource that can aid in the planning and development of higher education programmes. It can be used to map and embed content into modules and/or programmes, track input into the progress of skills and attributes throughout a programme, as well as in the evaluation of the effectiveness of programme delivery at meeting specific learning outcomes. Such streamlining of embedded content, tracking, and evaluating programme content may provide scope for positive developments in terms of intentionality of design for student learning (Amundsen et al., 2008).

The overall vision for ECAAPT is that it can be used at every level within a higher education institution to aid in tracking and embedding content in and across modules, years, and programmes, and ultimately link the delivery of this content to specific graduate attributes. As with any curricular mapping process, ECAAPT could add to the coherency of programmes and to the overall authenticity of learning for students in providing more structure to mapping and development processes, allowing for change and progress to be more successful.

Change is ubiquitous in higher education, and being able to manage change effectively is seen as a key criterion for professional practice and can also limit costly failures in implementing change (Scott, 1999). We are not putting ECAAPT forward as a magic bullet for change, but rather as a potentially useful cog in the wheel of change and progress that is adaptable to local purposes and contexts. Developed through practice, and including practical guidelines for use, ECAAPT provides users with a potentially more time-efficient process in the planning and mapping stages in higher education so that time and focus can be given to more in-depth, practical, and fruitful change and progress.

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